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No. 75 May, 1964

RESOURCE MANAGEMENT REPORT

ONTARIO

DEPARTMENT OF LANDS AND FORESTS

Hon. A. Kelso Roberts, Q.C.
Minister

F. A. MacDougall
Deputy Minister

(These Reports are for Intra-Departmental Information and Not for Publication)

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INFORMATION AND NOT FOR PUBLICATION)

PROGRESS IN LAW ENFORCEMENT IN ONTARIO*

by
F. A. Walden
Supervisor of Field Services

Abstract

Progress in law enforcement in Ontario is reviewed with respect to the number of convictions in the period 1955-60, as compared with 1935-39, and a summary of enforcement activities is given. Some attempts have been made to estimate the potential number of offences in a year and to develop a philosophy as to a suitable level of law enforcement activity.

A poster proclaiming certain game laws demonstrates that management of wildlife by regulation was already established in Ontario, or more properly Upper Canada, in 1856. Little, however, is known of the efforts made to enforce these laws. In 1867, when the Dominion of Canada was created, the principle that game management was a provincial responsibility was accepted, because of its possibilities as a source of direct taxes to the Provinces. Fisheries management, due to the magnitude of the marine and Great Lakes problems, remained as a Federal responsibility. Against this background the role of management by enforcement of fish and wildlife regulations can be interpreted.

In the report of the Ontario Game and Fish Commission of 1892, it is evident that lack of enforcement was a major concern. The report reads, in part: "It cannot be said that the Province has any organized service for Game and Fish protection, its condition in this respect being far behind that of several Canadian Provinces and all the immediately adjacent States of the Union."

According to Skuce (1958-59), there was one Chief Warden and four Wardens by 1895 and a number of Deputy Wardens.

In the final report of the Ontario Game and Fish Commission of 1909-11, concern was expressed for the lack of enforcement, political patronage and the very small pay (stipends of $25 to $200 per year) for enforcement officers.

In 1920, a complete reorganization of the Game and Fisheries Department resulted in the establishment of an organized enforcement service, with 60 or 70 fulltime overseers. Unfortunately, these

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* Paper presented at the 19th Annual Convention of the Association of Midwest Fish and Game Law Enforcement Officers, Denver, Colorado, June 14-15, 1963.

officers had little equipment, no uniforms, poor communications and few facilities for educational work. By 1927, a biological program had been organized, but its progress was interrupted by economic conditions after 1929. Enforcement continued to move ahead to some degree and in the early '30's, the force comprised 6 supervisors or wardens, 70 field officers and 10 patrol boats. Uniforms were issued for the first time. Skuce (personal communication) draws attention to the fact that people gained a much better idea of the value of natural resources during the depression years when many of them broke the law to obtain food. The number of violations increased and Department revenue declined as people could not afford licences or fees. The possibility of financial gain by some was not overlooked.

In 1946, the Ontario Department of Game and Fisheries and the Department of Lands and Forests were amalgamated. District offices of the latter Department already existed and a fish and wildlife specialist or supervisor was appointed to each of the field headquarters. There was a general increase in staff, bringing the conservation officer group, as they are now called, up to 200, and a program of recruiting biologists was developed. The present establishment of conservation officers is about 235. These are not all active officers in the field, however, since some are supervisors, and some while retaining their appointments as law enforcement officers, are primarily technicians in other aspects of the fisheries and wildlife management program. They are responsible for patrolling the 412,000 square miles of land surface comprising Ontario, together with the Canadian waters of the Great Lakes.

Shortly after 1950, the practice of making special appointments was begun. Up to this time if a conservation officer required the help of another member of the Department staff, a deputy chief or chief ranger, a forester or biologist, it was customary to appoint him as Deputy Game and Fishery Warden. However, there were some objections to asking uniformed Department personnel to accept the same type of appointment as a civilian volunteer worker. Special appointments as conservation officers now exceed 200 staff members who usually report the facts concerning a violation to the local officer, who in turn conducts the prosecution.

From the earliest days it had been the practice to utilize the assistance of volunteers known as deputy game and fishery wardens. Before 1900, these officers in some cases shared in the penalties assessed as fines, but in the last 40 years appointments have been on a purely voluntary basis and no pay given. By 1960, the number of deputies had grown to 1,400.

The objectives of fish and wildlife management in Ontario are set out in a policy statement which indicates that all programs will be considered in the light of the following principles, namely, sustained yield, full use, multiple land use and public use. (See Appendix 1.) The application of these principles is leading to fuller realization of recreational values by providing longer open seasons and more generous creel and bag limits. It is also evident that the law respecting fish and game is simply a vehicle to aid in achieving the objectives of management.

The place of the law is no different today than 100 years ago, but our appreciation and understanding of social and biological conditions is great enough now to judge much more competently what the law should be. For example, with respect to full use, we are anxious to increase the harvest of moose by 150 per cent. The moose inventory shows more than 130,000 moose in the Province and 43,000 licenced moose hunters are taking about 12,000 animals. A higher annual harvest of up to 30,000 moose would come closer to realizing the full biological potential of these animals and reduce the possibility of damage to the range. Thus, from a general closed season in 1949 we have moved to the point where there is a three month open season over 75 per cent of the Province, commencing in mid-September and extending past the New Year holiday. It follows that there are few convictions for taking moose in closed season.

The main function of an enforcement officer is to prevent violations. Thus our philosophy is that enforcement is embodied in our whole public educational program, up to and including prosecution. A major responsibility of the field officer is to attempt to change the attitude of potential violators. At the same time, attempts are being made to conduct a program of research in the field of law enforcement, since only by understanding the kinds and frequencies of offences, the areas in which they occur, the reasons for human behaviour in these particular respects, and the needs of our population in terms of outdoor recreation can we achieve a meaningful reduction in the number of violations. The measure of reasonable progress or success in law enforcement is particularly difficult. Analysis of law enforcement records must take account of the fact that wildlife laws are frequently changed and the extent to which people participate in the harvest of game and fish is influenced in great measure by prevailing social and economic conditions. A study of the numbers and kinds of violations in the period from 1935 to 1939 compared with those from 1955 to 1960 demonstrates certain trends concerned with the realization of wildlife values and the effects of intensive management programs. The examples, shown in Table I, are chosen from the total number of convictions on the basis that they were essentially similar, and in at least one of the periods they constituted an important part of the total offences.

TABLE I

Frequency of Occurrence of Selected Offences from 1935 to 1939 compared with 1955 to 1960.

	1935-39		1955-60	
Offence	Average Number of Convictions	Per cent of Average Total of Convictions	Average Number of Convictions	Per cent of Average Total of Convictions
Trap without a licence	45	4.2	14	0.5
All other fur offences	134	12.6	50	1.8
Hunt without a licence	191	18.1	521	19.5
Hunt in closed season	81	7.7	40	1.5
Illegally possess game .... (mostly in closed season)	87	8.2	89	3.3
Loaded firearm in a motor vehicle	10	0.9	209	7.8
Fish by means other than angling (nets, spears, etc.)	77	7.3	177	6.6
Illegally possess fish .... (undersize, closed season, over creel limit)	106	10.0	285	10.6
Average total number of convictions per year	1056	100%	2669	100%

The data in Table I should be interpreted against the background of the number of persons interested in hunting, fishing or trapping. Participation in trapping is quite well documented, but interest in hunting and fishing can only be estimated from the population and licence sale figures presented in Table II. There is no resident fishing licence in Ontario, but the results of market type surveys indicate approximately 400,000 persons hunted and somewhat more than 1,000,000 fished in 1960.

TABLE II

Participation in Fishing and Hunting in
1935 to 1939 compared with 1955 to 1960.

	1935-39	1955-60
Population	3,600,000	5,600,000
Number of Resident hunting licences sold	113,500	488,000
Number of Non-resident hunting licences sold	3,565*	18,800
Number of Non-resident angling licences sold	58,759*	390,000

(* for 1938 only)

Licence sales indicate a greater number purchased hunting licences than reported in the survey, but some hunters hold more than one type of licence. Licence sales have increased at a greater rate than the population, indicating greater public interest in hunting.

Referring to Table I, there has been no change in the system of licencing during the 25 years in which both periods occur. There is little change in the proportion of the offences concerned with hunting without a licence in either period. The number of offences in connection with closed seasons has declined from 7.8 per cent of the convictions to 1.5 per cent and this is attributed to increases in the length of the open seasons. Charges for illegal possession, mostly during closed season, have correspondingly declined. The marked increase in the use of cars for hunting, and generally increased participation in outdoor recreation appears to be the main cause of a major increase in convictions for possession of loaded firearms in motor vehicles. Before 1940, there was a tradition that "the hunt" was a kind of special occasion. Big game hunters went north by train. Upland game was mainly of local interest. Since 1950, the hunter has driven to his summer cottage or favourite hunting area and hunts more often than before. While the prohibition on carrying a loaded gun in, or discharging it from a car was created in 1927, primarily to prevent deer and other game from being too easily shot, there has been much emphasis in recent years on the safety aspects. A considerable number of hunters still attempt to take game, especially at night from motor vehicles. Thus the increase in offences recorded may be the result of increased vigilance by conservation officers, and greater competition among hunters for game.

The problems with fishery violations appear more complex, since the proportion of offences concerned with taking fish by illegal means, including nets, spears and set lines, has remained almost the same, and in spite of liberalization with respect to size limits, the percentage of offences connected with illegal possession has not declined. There appears to be an increasing tendency for anglers to take more fish than permitted in the regulations and to retain fish taken in closed season.

With reference to trapping, there has been an important change. About 1937 a system of zoning trapline areas was tried experimentally, but due to the war progress was limited. In 1947, the program was intensified and most of the Crown or public lands (300,000 square miles approximately) were assigned to individual trappers on condition that they occupy their traplines two weeks prior to and during the trapping season to prevent poaching of fur. In the areas where there was little or no Crown land the number of local resident trappers was limited. The holders of trapping licences were given a quota of beaver, based on the number of live beaver houses on their area. Determination of suitable quotas of marten and fisher were much more difficult, but estimates were made. Finally, a numbered box car type of seal had to be fastened to each pelt of a beaver, fisher, marten, otter and mink by a sealing officer before it could be sold. As indicated in Table I, the number of offences declined remarkably from 1939 to 1960. Meanwhile, the figures in Table III demonstrate a large expansion in the production of fur.

TABLE III

Expansion of Fur Trapping in Ontario
1935-39 to 1955-60.

	1935-39	1955-60
Average number of Trappers per year	5,605	9,854
Average number of pelts taken per year:		
Beaver	2,156	116,240
Fisher	1,821	2,725
Marten	1,632	4,315
Mink	32,216	37,545
Muskrat	405,387	453,729
Otter	3,745	6,714
Totals	446,957	621,268
Average value of total pelts	$1,031,845	$2,629,450
Number of Offences:		
Trapping without licence	45	14
All other offences	134	50

In the later period, with an increase of 76 per cent in the number of trappers, and with 61 per cent more pelts handled having a value 155 per cent greater, the number of offences decreased by 64 per cent.

The 1930's saw large scale poaching and illegal selling of fur. Professional buyers encouraged local settlers throughout the north to trap beaver at a time when there was a general closed season. One of these, apprehended with about 7,000 illegal pelts, was faced with a fine of $14,000. Intensive and liberal management has contributed to a decline in violations, but there is no indication of damage to the resource. In fact, there has been a general increase in production of each kind of fur.

To provide a better basis on which to evaluate the success of the law enforcement program, an attempt has been made to determine the frequency of occurrence of violations among sportsmen. Conservation officers have been requested to report on the number of persons contacted in the field, the number of warnings issued respecting violations and the number of convictions registered. Uniform reports for the Province are not available, but the results for Port Arthur District are summarized in Table IV.

TABLE IV

Summary of Enforcement Activities
Port Arthur District, 1961-62.

	Resident	Non-resident	Total
Number checked	17,740	3,489	21,229
Per cent Charged	0.49%	0.63%	0.51%
Warned	0.22	0.49	0.31
Per cent Violations .... (including warnings)	0.71	1.88	0.82

Thus, for all sportsmen, 8.2 in 1,000 have been found in violation. In 3.1 cases officers have felt that a warning was sufficient, but in 5.1 cases charges were laid. Figures for the preceding two years were similar. It must be remembered that while these figures give a fair idea of the number of violations an officer can expect to meet in the course of his daily contacts with the public, it gives little idea of the number of planned violations such as deer-shining. Such near-criminal activities must be considered differently as a law enforcement problem.

This information can be projected for the whole of Ontario, with some reservations due to differences in the nature of hunting and fishing, the regulations locally and in the population statistics for northern as opposed to southern Ontario. A conservative estimate of the numbers of resident anglers and hunters is 1,200,000. To this may be added at least 400,000 non-residents who come to Ontario each year to hunt or fish. In this total of 1,600,000, at the rate of 8.1 violations per 1,000 there are 12,800 violators. Warnings would be appropriate in 4,800 cases, and court action would be required in 8,000 cases.

It is not possible for the present enforcement staff to do more than sample the population of sportsmen however. The results of this sampling, indicated by the total of all convictions over the past eight fiscal years follows:

1955-56	2,895	Convictions
1956-57	2,704	"
1957-58	2,993	"
1958-59	2,525	"
1959-60	2,228	"
1960-61	2,207	"
1961-62	2,049	"
1962-63	2,045	

Convictions are being registered in a little over 15 per cent of the estimated number of violations among hunters and anglers in a year. Unfortunately, no information is available with respect to the possible number of premeditated offences. These are of the greatest importance since, while they may have little effect on the management program, they indicate utter contempt for the law.

The ideal might be to eliminate violations, but this is obviously impossible, so our objectives should be clearly enunciated to permit measurement of success.

With decreasing numbers of convictions during the last eight years, it would be pleasant to conclude that at last our public relations and education program was achieving the desired results. This conclusion would not take account of changes in the laws which have eliminated certain fishing offences, increasing participation by conservation officers in the biological phases of a growing management program, or the introduction of a mandatory forty hour work week, without a corresponding increase in field staff. Nor would it take account of the fact that in the area most affected by changes in the fishery regulations, a sharp decline in numbers of convictions was soon followed by an upswing, though not to the previous level, as officers concentrated on other violations.

However, participation in aerial moose surveys, deer yard cruises and game bag and creel censuses are not simply necessary diversions for conservation officers, which interfere with enforcement, for they have frequently brought the officer into contact with more sportsmen than he would otherwise have met.

Definition of an adequate level of law enforcement might be considered in relation to the degree in which our fish and wildlife management objectives have been achieved. Progress is being made in habitat improvement, species management of waterfowl, organization of public hunting areas and in other ways. Increasing biological knowledge will tend to stop the process of simplifying laws and will actually lead to more regulations. An encouraging part of the picture is the indication that intensive management leads to decreases in the number of law infractions. This has been illustrated clearly in fur management and to a lesser degree with respect to hunting. But there can be no question that law enforcement will increase in importance as a means of achieving management objectives.

The question of a suitable level of enforcement activity must surely vary, depending on circumstances at the time in each situation. In Ontario, with increasing interest in hunting and fishing on the part of the public, and a growing participation in the whole management picture, our officers are encouraged to direct their activities first towards those violations which interfere with attaining clearly defined management objectives. The greatest difficulty is to resolve the conflict for the time a conservation officer has to achieve enforcement essential to management and to deal adequately with expressions of contempt for the law. Overall success will not be measured in numbers of convictions so much as the degree in which we are able to provide maximum fish and wildlife resource values for our citizens.

I should like to express my appreciation to several of my colleagues in the Department, and particularly Messieurs E. L. Skuce and H. G. Lumsden, all of whom have given their time to discuss with me various aspects of law enforcement philosophy and practice.

Literature Cited

Report of the Ontario Game and Fish Commission, Toronto, 1892.

Skuce, E. L. 1958-1959. Enforcement of Fish and Wildlife Regulations in Ontario, 1890-1958, in Conservation Officer Reports, Volume VI, Southwestern Region, Ontario Department of Lands and Forests.

Appendix 1.

DEPARTMENT OF LANDS AND FORESTS

CIRCULAR F.W. 16-6

TO: BRANCH CHIEFS AND FIELD OFFICES

RE: POLICY STATEMENT, FISH AND WILDLIFE

For the general guidance of all staff the following statement of the policy which will guide future activities in the field of fish and wildlife utilization and management is presented.

All proposals for management programs, legislation, or other activities in these field will be considered in the light of the following principles:

Sustained yield. This means the maintenance of a stock which will produce a sustained annual harvest. Hunting and fishing will be limited or regulated only to the extent that these activities limit the size of the parent stock. Where there is no evidence that hunting and angling are limiting parent stocks, restrictive action is not necessary. Alternatively, if biological evidence is obtained that stocks are being depleted by hunting or angling pressure, restrictive action may be necessary. (No instance of the latter condition is known to have occurred in Ontario to date.)

Full use. Legislation, management programs, and public relations programs will be directed toward encouraging the harvesting of the entire annual increment of fish and game species. Wherever possible, as by habitat manipulation, etc., this harvestable surplus should be increased. Where an unused surplus exists due to access restrictions, access should be provided. Each unused surplus and any land or water area which could produce more, is a challenge to the fish and game manager to promote full use, or to increase the surplus.

Multiple land use. The production of fish and game is compatible with other forms of land and water use. All the aspects of land and water use in any area are considered in the assessment of public benefit to be derived from land use plans. An integral part of this process must be the consideration of fish and wildlife values. District fish and wildlife staffs must be prepared to discuss these values in detail at planning conferences. These values may be primary, secondary, or tertiary, or lower in the allocation of land or water use in a given area. The important point is that they must be fully considered and the proper allocation assigned.

Public use. Fish and wildlife are the basis for universally popular forms of recreation which are of great benefit to the economy and morale of the population. Any plans, programs, or legislation must be directed to promoting and encouraging public use rather than restricting or discouraging it. As a general principle, the more public use that can be made of these resources, the better the management. Any suggestion which tends to limit use will receive the most careful scrutiny, and must be considered undesirable unless definitely proven to be otherwise.

Several important effects will result from the recognition of these principles. For example;

(a) General lengthening of seasons and increasing of bag and creel limits.

(b) Recognition that logging and other forms of forest use are important tools which the wildlife manager must learn to use. Close integration between forestry and fish and wildlife staffs.

(c) Opening of logging roads for hunters and anglers and improvement of access generally.

(d) Legislation and regulation which recognizes and reflects the principles described.

Of necessity, these are long term objectives depending upon public acceptance of such programs and funds and staff provisions available for carrying them out. This circular is intended to lay out objectives toward which our staff must work in the future.

"F. A. MacDougall"

F. A. MacDougall,
Deputy Minister.

Compiled by Fish and Wildlife Branch, February 23, 1961.

Issued: March 2, 1961.

A COMPARISON OF MOOSE AGE DATA COLLECTED FROM TWO AREAS DIFFERING IN ACCESSIBILITY TO HUNTERS

by
D. W. Simkin
Biologist, Research Branch, Maple

Abstract

Advantage was taken of a Red Lake Highway big game checking station to collect wear-class data from moose taken in the years 1957 to 1963. A new regulation was introduced in 1963 which permitted unlimited use of aircraft for spotting moose in areas which were previously only very lightly hunted due to lack of access. The 1963 data were classified as originating in accessible areas or inaccessible areas available only to aircraft. This was done in order to determine if there was any difference in either hunter selection or availability of moose of different ages between the two areas. When a comparison was made it became apparent that there were large differences in the distribution between strata. It was felt that if summaries of wear-class data collected from hunter-killed moose from easily accessible areas with heavy hunting pressure and areas difficult of access with light hunting pressure are to be of value a distinction between samples from the two areas must be made.

The Fish and Wildlife staff of most districts within the areas of the Province where there is an open season for moose annually collect moose jaws from hunter-killed animals. These jaws are used to determine the relative ages of the animals in the kill. The wear-class distributions obtained are believed to be representative of the age structure of the herd. In order to use such data the following assumptions must be made:

(a) Moose of all ages (wear-classes) are equally vulnerable to hunters.

(b) There is no hunter selection for animals of a special age group.

A big game checking station has been in operation every year since 1957 on the Red Lake Highway. Usually this station is manned for the first two weeks of October; a period during which most of the annual moose hunting pressure is expended and most of the kill is made. Wear-class data collected at this station in the years 1957 to 1961 were reported in a recent study of reproduction and productivity of the moose in this area (Simkin, 1963)*. They are included in Table 1. All of these data are comparable since they were collected in the same manner and analyzed by the same personnel.

A new regulation was introduced in 1963 which permitted unlimited use of aircraft for spotting moose in a large area of range which was previously only very lightly hunted due to lack of access.

Table 1: Wear-class distribution of adult moose aged at Red Lake Road checking station, 1957-1961 (expressed as per cent of sample)

Wear Class	Year					
	1957	1958	1959	1960	1961	Total
I	38.9	29.3	38.6	38.7	41.3	37.2
II	11.1	13.9	15.8	18.3	11.5	14.0
III	13.2	14.4	8.2	12.4	9.9	11.4
IV	7.6	11.5	7.6	7.5	9.9	9.2
V	7.6	12.5	9.5	4.8	7.5	8.3
VI	11.1	8.2	7.6	5.9	6.3	7.0
VII	7.6	4.8	5.7	5.4	7.1	6.1
VIII	1.4	3.9	2.5	4.8	3.9	3.5
IX	1.4	1.4	4.4	1.6	2.4	1.0
No. Aged	144	208	158	185	252	947

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* A Study of Moose Reproduction and Productivity in Northwestern Ontario. Unpublished Master's Thesis. Cornell University, Ithaca, N. Y. 1963, by D. W. Simkin.

Many early season hunters took advantage of this change in regulations and flew in to more or less virgin areas to hunt. All animals passing through the checking station in 1963 were classified as originating in accessible areas (i.e. shot in areas accessible by roads or waterways which in turn were accessible by roads), or inaccessible areas (i.e. where the only means of access was aircraft). The reason for this was to determine whether there was a difference in either hunter selection or availability of moose of different ages between the areas. The data collected at the Red Lake Road checking station in 1963 are reported in Table 2.

Table 2: Comparison of wear-class distributions of moose killed in accessible and inaccessible areas and aged at Red Lake Road checking station, 1963 (Expressed as per cent of sample)

Wear Class	Overall	Accessible	Inacessible
I	30.05	37.0	17.2
II	12.02	15.1	6.3
III	10.38	10.9	9.4
IV	10.92	12.6	7.8
V	15.30	12.6	20.3
VI	9.84	6.7	15.6
VII	5.46	1.7	12.5
VIII	2.73	1.7	4.7
IX	3.28	1.7	6.3
No. Aged	183	119	64

Results

It is obvious from Table 1 that the wear-class distribution of moose killed in the period 1957-1961 was very similar each year. Regression lines calculated for these distributions were as follows:

1957 $Y = 32.28 - 2.866X$
1958 $Y = 31.50 - 2.632X$
1959 $Y = 31.50 - 2.560X$
1960 $Y = 32.72 - 2.979X$
1961 $Y = 31.81 - 2.728X$
Overall $Y = 31.81 - 2.728X$

There is no significant difference between these six lines. This is what we expect if there is no change in the herd structure or hunter selection throughout the period.

A comparison of the 1957-61 data with the overall 1963 data in Table 2 shows that there was a higher proportion of old animals killed in 1963. A possible explanation for this difference was a change in the degree of selectivity exerted by the hunters.

When the 1963 data were divided into two strata based on accessibility it became apparent that there were large differences in the distributions between strata. The wear-class distribution of animals from accessible areas was very similar to the distributions in Table 1. The calculated regression line was $Y = 33.88 - 3.26X$. On the other hand the data from inaccessible areas were markedly different than for any other year and instead of the distribution being linear it was bi-modal with peaks at wear-classes I and V.

In the accessible areas 24 per cent of the moose killed were in the wear-class V and older group while in the inaccessible area 59 per cent were in this older group.

Discussion

I believe the main reasons for the differences between wear-class distributions of moose killed in inaccessible and accessible areas can be attributed to hunting pressure and hunter selection. Hunting pressure is much greater in accessible areas, consequently hunters are more inclined to shoot the first moose which they encounter. On the other hand, hunting pressure is greatly reduced in the areas accessible only by aircraft. Many of the hunters have spent extra money for flying service mainly to get to an area where they have a better chance of shooting a trophy bull, and because there is not as much competition for the available moose a hunter in this area is much more likely to pass up a shot at a young animal.

Many districts now have a situation similar to the one described above, i.e. they are collecting and combining data on moose killed in heavily hunted and lightly hunted areas. It is difficult to distinguish between a meat hunter and a trophy hunter but generally in the parts of the Sioux Lookout and Kenora Forest Districts within our Red Lake Road study area, the hunters in the accessible areas will kill what they see, while those who pay extra money to fly to out-of-the-way areas will be selective.

Obviously the overall wear-class distribution data (at Red Lake Road) collected in the 1963 season were distorted. Stratification allowed us to obtain data which could be compared with previous years' figures and to see what differences there were between the kill composition in the heavily hunted and lightly hunted areas.

Conclusions

There is a significant difference in the wear-class distribution of the kill between areas of good access with heavy hunting pressure and areas accessible only by aircraft where hunting pressure is light and hunter selection is more prevalent. If summaries of wear-class data collected from hunter-killed moose are to be of value, a distinction between samples from the two types of areas must be made.

MOOSE BROWSE AND PELLET STUDIES IN THE GERALDTON DISTRICT, 1963

by
B. Gibson, Biologist

Abstract

A modified Passmore-Hepburn range evaluation was carried out on a one square mile moose winter concentration area during May, 1963 in the Geraldton District. Calculations revealed that between 39.8 per cent and 62.6 per cent of the available browse species were utilized by moose. As high as 29.3 per cent of the browsed mountain ash were killed. Hedging of browse species ranged from zero per cent for cherries to as high as 24.3 per cent for balsam. A calculated total of 10,264 browse plants per acre is present on the surveyed range. Calculations from pellet counts suggest a density of from 17.7 to 18.3 moose per square mile during the winter of 1962-63 on the survey site.

Introduction

For the first time since 1958, a moose browse study was conducted in the Geraldton District, during May of 1963. A Passmore-Hepburn range analysis on a simplified scale as described by Biologist J. B. Dawson in a memorandum of April 11, 1963 was used. It is hoped that browse surveys in other areas can be conducted annually in order to assess the District's moose range. These surveys will aid in predicting the future of the moose range on which the browse surveys are conducted. In turn, predictions can be made on the densities of moose that these areas will support as the range becomes more heavily browsed. As browsing increases and as succession advances, these areas can be expected to support fewer moose.

Purpose of Survey

There is increasing concern among biologists that much of Ontario's present moose range is nearing its maximum winter carrying capacity. Some areas might be presently sustaining a winter moose population that exceeds the range's carrying capacity. In these localities overbrowsing and damage to plant species on which moose feed will occur. Undoubtedly, as severe browse damage occurs, the range will support fewer animals; a decline in moose numbers in these areas can be anticipated.

It is feared that in the regions that have exceeded their carrying capacity for moose the effects of malnutrition will be evident. Actual starvation of animals is not expected; however, gradual lowering of reproductive rates and a possibility of these areas becoming centres of moose diseases is a threat to the moose population. In turn, lower populations of moose will be found. If we can follow and predict population trends of this mammal, management of the species will be considerably advanced.

Description of the Area

The area surveyed lies approximately 10 lineal miles south of Geraldton in the southeast corner of Salsberg Township. It is one square mile in area adjacent to and north of the Wintering River road (see attached map)*. The site is easily reached via the Goldfield Road. Co-ordinates of the site are 49°35'30" N. latitude and 87°02'00"W. longitude.

The site of the survey is in an area originally logged in 1943. Large white spruce and jackpine - some of the stumps were up to 16 inches in diameter - originally formed the overstory. Selective cutting of these species during the war years removed some climax trees. The area was clear cut for pulpwood species in 1951 and 1952. A 20-40 per cent crown density of black spruce and jackpine now forms the overstory. Removal of the climax trees allowed an abundant growth of balsam, second growth jackpine, poplar, willow and dogwood to succeed. In lesser abundance, are found white birch, mountain ash, mountain maple, pin cherry and hazel. Old tote roads now in willow, dogwood and hazel stages of succession are common. The growth of these browse species is very heavy in some regions. In many cases movement through some areas was impeded by their abundance.

The site is on a dump till area ranging from fine to coarse gravel and large boulders. The terrain slopes upwards gently from the east to the west and north. Swamp conditions supporting black spruce are found at the eastern portions of the site. The transition to upland areas is evident west of plot 9, where the area is more rolling and drainage of water is better. Most of the area is quite damp. The soil is believed to be more fertile than in many other areas of the District.

The survey site was chosen because of a general knowledge of the area's high moose density. Also the aerial census completed during the winter of 1960 revealed a density of one moose per 1.4 square miles in a 25 square mile area which included the site of the 1963 browse survey. The 1960 study was conducted between December 7, 1959 and April 1, 1960.

*Map - A large scale map accompanied the original report now in the Fish and Wildlife Library, Maple.

Method

A. Browse Survey

A one square mile (640 acres) area, was chosen for the browse study. The survey was conducted between May 16 and May 30, 1963. Ground vegetation and leaves had not developed at this time.

A modified version of the Passmore-Hepburn system was used, providing a rapid and simple range appraisal. A F.R.I. map of the area chosen was used. The site, because it is characterized by rolling land being in a north to south direction, was surveyed from east to west. This enabled us to achieve a more even distribution of the sample on the site. The cruise lines were pre-selected to reduce bias and were marked on the field map. Advantage of the Wintering River Road in access to the site was taken.

The sampling rate was 64 plots for the one square mile area. Four transects, spaced 20 chains apart were run due west. Each transect was, of course, one mile long. Four chain intervals separated each plot. A total of 16 plots resulted for each transect, giving for the four lines the total of 64 plots. Individual plot size was 66 feet by 2 feet or 1/330 of an acre. A compass bearing of due west was maintained. Observations of browsing on ten common moose browse species were made one foot on each side of the chain. These species are listed on the browse tally forms at the back of this report. At the same time, moose pellet counts were made 6.6 feet on each side of the chain, on plots 1/50 of an acre in size. Entries on the tally sheet were made under the following:

Plot Records

(a) Under L -- The number of living plants of each of the ten species or genera was recorded. This column refers to live plants available for moose feed between 2 and 10 feet above ground. The maples, cherries, poplars and dogwoods were grouped so that one record was made for each genus (species).

(b) Under K -- The number of stems of each of the 10 species which have been killed by past moose browsing. This did not include plants killed by other causes such as mice or hares.

(c) Under B -- The number of plants in each of the 10 species which have been browsed during the current season (last fall to this spring).

(d) Under H -- The number of plants in each species which showed moderate to heavy browsing. In many cases heavy browsing will have obviously changed the shape of the plant. In some cases more browse is produced through branching; in others the plant is weakened; often parts of the plant are killed by continued browsing.

Note: If a plant was browsed or hedged, and alive, it was classified in each of the categories on the tally form.

Compilation

The information collected gives the following statistics for each of the 10 plant species.

(1) Frequency index: A measure of distribution over the area sampled, calculated as

$$\frac{\text{Number of plots on which each species occurs}}{\text{Number of plots in the sample}}$$

1. White Birch - $\frac{35}{64}$ = 0.55
2. Balsam - $\frac{60}{64}$ = 0.94
3. Mountain Ash - $\frac{42}{64}$ = 0.66
4. Willows - $\frac{51}{64}$ = 0.79
5. Maples - $\frac{26}{64}$ = 0.41
6. Dogwoods - $\frac{38}{64}$ = 0.59
7. Cherries - $\frac{41}{64}$ = 0.64
8. June Berries - $\frac{12}{64}$ = 0.19
9. Poplars - $\frac{58}{64}$ = 0.91
10. Hazel - $\frac{28}{64}$ = 0.44

(2) Living plants of each species per acre, which is a measure of productivity calculated as

$$\frac{\text{E L} \times 330}{\text{Number of plots in sample}}$$

1. White Birch - $\frac{141 \times 330}{64}$ = 727

2. Balsam - $\frac{398 \times 330}{64}$ = 2052

3. Mountain Ash - $\frac{70 \times 330}{64}$ = 361

4. Willows - $\frac{391 \times 330}{64}$ = 2016

5. Maples - $\frac{91 \times 330}{64}$ = 469

6. Dogwoods - $\frac{219 \times 330}{64}$ = 1129

7. Cherries - $\frac{83 \times 330}{64}$ = 428

8. June Berries - $\frac{15 \times 330}{64}$ = 77

9. Poplars - $\frac{458 \times 330}{64}$ = 2361

10. Hazel - $\frac{125 \times 330}{64}$ = 644

(3) Percentage of plants browsed - a measure of current use for each of the species calculated as

$$\frac{\text{E B}}{\text{E L}} \times 100$$

1. White Birch - $\frac{82}{141} \times 100$ = 58.1%

2. Balsam - $\frac{176}{398} \times 100$ = 44.2%

3. Mountain Ash - $\frac{37}{70} \times 100$ = 52.9%

4. Willows - $\frac{230}{391} \times 100$ = 58.8%

5. Maples - $\frac{57}{91} \times 100 = 62.6\%$

6. Dogwoods - $\frac{120}{219} \times 100 = 54.8\%$

7. Cherries - $\frac{33}{83} \times 100 = 39.8\%$

8. June Berries - $\frac{6}{15} \times 100 = 40.0\%$

9. Poplars - $\frac{255}{458} \times 100 = 55.7\%$

10. Hazel - $\frac{67}{125} \times 100 = 53.6\%$

(4) Percentage of plants killed - a measure of past use for each of the 10 species, calculated as

$$\frac{E\,K}{E\,K + E\,L} \times 100$$

1. White Birch - $\frac{13}{13 + 141} \times 100 = 8.5\%$

2. Balsam - $\frac{25}{25 + 398} \times 100 = 5.9\%$

3. Mountain Ash - $\frac{29}{29 + 70} \times 100 = 29.3\%$

4. Willows - $\frac{16}{16 + 391} \times 100 = 3.9\%$

5. Maples - $\frac{4}{4 + 91} \times 100 = 4.2\%$

6. Dogwoods - $\frac{10}{10 + 219} \times 100 = 4.4\%$

7. Cherries - $\frac{2}{2 + 83} \times 100 = 2.3\%$

8. June Berries - $\frac{0}{0 + 15} \times 100 = 0\%$

9. Poplars - $\frac{49}{49 + 458} \times 100 = 9.7\%$

10. Hazel - $\frac{0}{0 + 125} \times 100 = 0\%$

(5) Percentage of stems in each species which show hedging effect - an additional measure of past use calculated as

$$\frac{E\ H}{E\ L} \times 100$$

1. White Birch - $\frac{26}{141} \times 100$ = 18.4%
2. Balsam - $\frac{97}{398} \times 100$ = 24.3%
3. Mountain Ash - $\frac{15}{70} \times 100$ = 21.4%
4. Willows - $\frac{75}{391} \times 100$ = 19.2%
5. Maples - $\frac{12}{91} \times 100$ = 13.2%
6. Dogwoods - $\frac{34}{219} \times 100$ = 15.5%
7. Cherries - $\frac{0}{83} \times 100$ = 0%
8. June Berries - $\frac{0}{15} \times 100$ = 0%
9. Poplars - $\frac{60}{458} \times 100$ = 13.1%
10. Hazel - $\frac{5}{125} \times 100$ = 4.0%

(6) Percentage of available browse supplied by all 10 species which is supplied by each of the species - a measure of relative availability calculated as

$$\frac{E\ L\ \text{(single species)}}{E\ L\ \text{(all species)}} \times 100$$

1. White Birch - $\frac{141 \times 100}{1991}$ = 7.1%
2. Balsam - $\frac{398 \times 100}{1991}$ = 20.0%
3. Mountain Ash - $\frac{70 \times 100}{1991}$ - 3.5%

4. Willows - $\frac{391 \times 100}{1991} = 19.6\%$
5. Maples - $\frac{91 \times 100}{1991} = 4.6\%$
6. Dogwoods - $\frac{219 \times 100}{1991} = 11.0\%$
7. Cherries - $\frac{83 \times 100}{1991} = 4.2\%$
8. June Berries - $\frac{15 \times 100}{1991} = 0.7\%$
9. Poplars - $\frac{458 \times 100}{1991} = 23.0\%$
10. Hazel - $\frac{125 \times 100}{1991} = 6.3\%$

Discussion and Observations

(1) Frequency index -- Balsam was the most widely distributed species, occurring on 60 of 64 or 94 per cent of the plots. Poplars and willows were next in distribution being found on 91 per cent and 74 per cent of the plots, respectively. Least widely distributed was June berry, being found on only 19 per cent of the plots.

(2) Living plants -- Although found on more plots, there was less balsam than poplar, which was the most abundant species. Balsam and willow followed in this order. Least numerous were hazel, maples, mountain ash, cherries and June berries. A calculated total of 10,264 browse plants per acre is indicative of the high quality of the range. The numerical abundance and variety of living plants indicate that the survey site has been, if it is not now, ideal moose habitat. It appears likely that range quality will deteriorate in the near future as succession takes over. Within a few years much of the balsam and poplar will be too high for moose to browse. As succession progresses, there will likely be less new browse growth. Browse species, which do not grow out of reach of the moose will likely be utilized at an increasing rate. This will rapidly alter the carrying capacity of the range, which will support progressively fewer moose.

(3) Percentage of plants browsed -- Maples were the most heavily browsed species with 62.6 per cent of the available plants of this species being browsed. Willows with 58.8 percent and white birch 58.1 per cent were next in order of the percentage of plants browsed. In all ten plant species, 39 per cent or more were browsed for each species. For the ten species tallied an over-all average of 52.0 per cent of the available plants were browsed. This would indicate very heavy utilization by moose. No clearly defined species preference is indicated by the figures. Probably the greater availability of some of the species accounts for their high degree of utilization for browse, rather than any decided preference for species.

(4) Per cent of plants killed -- Mountain ash showed the highest calculated percentage of plants killed from browsing (29.3 per cent). Poplars with 9.7 per cent killed were next, followed closely by white birch with 8.5 per cent. Broken poplar that had been straddled by moose and killed were seen on several occasions. The average calculated per cent of browse killed for all species amounted to 6.8 per cent.

(5) Per cent of hedged plants -- Balsam exhibited the highest calculated percentage of hedging of all the species with 24.3 per cent being hedged. Simkin (1959) found hedging of balsam to be 19 per cent in one area and 60 per cent in another area of the Sioux Lookout District. He attributed the high rate of hedging in the one area to its poorer range quality. He believed that the percentage of balsam hedged was a good indication of the range's quality.

In our study area the percentage of hedged balsam probably is not more severe because of the abundance of dogwoods, willows and poplars. These probably act as buffers, relieving browsing pressure on the balsam. Probably, where only a few browse species occur, and where they are not very abundant, hedging would be greater as browsing is confined to these few species.

(6) Percentage of available browse -- Balsam contributed 20.0 per cent, poplar 23.0 per cent and willows 19.6 per cent of the total browse available. The three species contributed 62.6 per cent of the browse available. The other species each contributed 11.0 per cent or less of the available browse.

B. Population Estimates from Pellet Group Counts

As was mentioned previously, moose pellet counts were recorded at the same time as the browse survey was conducted. Pellet groups were recorded on 1/50 acre plots. The strip width was 13.2 feet or 6.6 feet on each side of the chain. In mixed forests - that is, mixed coniferous and deciduous forests - all pellet groups lying on top of the leaves were recorded. Leaf fall in the autumn of 1962 was completed by approximately October 20. A period of approximately 220 days lapsed from leaf fall to the completion of the survey (May 30). All pellet groups lying on top of the leaves could be assumed to have been deposited after October 20. All pellet groups, which by colour and texture appeared to have been dropped since the autumn of 1962 in coniferous areas, were tallied.

The number of pellet groups recorded for each plot varied from zero to a high of 5 crotisings. Most plots had from 1 to 3 pellet group counts. A total of 103 pellet groups was tallied on the 64 plots.

Calculations from Pellet Group Counts

Results and Discussion

1. Average number of pellet groups per acre, calculated as the average count per plot X 50.
   Average count per plot = $\frac{103}{64}$ = 1.61 groups
   Pellet groups per acre = 1.61 x 50 = 80.5 average

2. Moose-days per square mile, calculated as
   $$\frac{\text{Pellet groups per acre X 640}}{\text{Deposition rate (13)}}$$
   or $\frac{80.5 \times 640}{13} = \frac{51,520}{13}$ = 3938.5 moose-days per square mile

3. Moose per square mile calculated as
   $$\frac{\text{Moose-days per square mile}}{\text{Number of days of pellet deposition}}$$
   or $\frac{3938.5}{220}$ = 17.9

Upper and lower limits at the 95 per cent confidence level were obtained from the frequency distribution of pellet groups as follows:

1. Number of pellet groups per acre

Number of plots = 64
Sum of squares = 98.04
Degrees of freedom = n-1 = 63
Variance = $\frac{98.04}{63}$

$$\text{Standard deviation} = \sqrt{\frac{\sum x^2}{n-1}}$$

$$\text{or } s = \sqrt{\frac{98.04}{63}} = 0.124$$

$$\text{The standard error} = \frac{\text{standard deviation}}{\sqrt{\text{number of observations}}}$$

$$\text{or } S_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{0.124}{\sqrt{64}} = 0.0155$$

Applying a "t" test from the following formula $\pm t = \frac{(\bar{x} - u)}{S_{\bar{x}}}$, we can arrive at a statement of confidence or fiducial statement about the sample mean $\bar{x}$ using the 5 per cent level of probability. By transposing in the above equation $u = \bar{x} \pm ts_{\bar{x}}$

From the "t" table $t_{.05}$ for 63 degrees of freedom = 2.000

Population mean = u = sample mean $\pm$ ($t_{.05}$) (standard) (error)

or $u = 1.61 + (2.000)\ (0.015) = 1.63$ for upper limits
or $u = 1.61 - (2.000)\ (0.015) = 1.58$ for lower limits

Therefore, in the sampled moose pellet counts, the mean number of pellet groups per plot is between 1.58 and 1.63 tending towards the upper limits. This range should be correct at the 95 per cent fiducial interval.

Therefore, the moose pellet counts per acre should range
from 50 x 1.64 = 82.00 for upper limits
or 50 x 1.58 = 79.00 for lower limits

2. Moose-days per square mile

$$= 82.00 \times \frac{640}{13} = \frac{52480.00}{13} = 4036.92 \quad - \quad \text{upper limits}$$

$$= 79.00 \times \frac{640}{13} = \frac{50560.00}{13} = 3889.23 \quad - \quad \text{lower limits}$$

Therefore, on the sampled area the moose-days per square mile should range from 3889.23 to 4036.92

3. Moose per square mile

$$= \frac{4036.92}{220} = 18.3 \quad - \quad \text{upper limits}$$

$$\text{or} \quad \frac{3889.23}{220} = 17.7 \quad - \quad \text{lower limits}$$

Therefore, in the sampled area, the mean number of moose per square mile should lie between 17.7 and 18.3 at the 95 per cent fiducial interval.

This density, however, seems to be exceptionally high. I doubt very much that densities remotely approaching this level are found on the surveyed area.

Possibly incorrect aging of pellet groups has entered a bias in our results. Reliance upon "how old" pellet groups appear leaves much allowance for bias. Many of the pellet groups in the conifer areas, in particular, could have been deposited previous to leaf fall.

Another possible source of error is in the defecation rate of 13 times daily for moose. To my knowledge, the mean rate of daily pellet deposition has not been derived for Ontario moose. Studies of these rates will be necessary before much reliance can be placed on the accepted daily figure of 13 depositions per day. It seems likely that various diets could affect the deposition rate.

Undoubtedly the surveyed area can support, and has supported, a relatively high moose population in the past. It is impossible, however, to believe that a density of 17 to 18 animals per square mile was in the area last winter.

Summary and Conclusions

1. A modified Passmore-Hepburn range appraisal was conducted on a one square mile area in the Geraldton District.

2. Between 39.8 per cent and 62.6 per cent of the available browse species were calculated to have been browsed. Calculations revealed that up to 29.3 per cent of the browsed mountain ash were killed; hedging was calculated to range from zero per cent for cherries to as high as 24.3 per cent for balsam.

3. A calculated total of 10,264 browse plants per acre is present on the range surveyed.

4. Densities of moose were calculated from pellet groups to range from 17.7 to 18.3 animals per square mile during the winter of 1962-63. These figures are not believed to even remotely represent the density this area supported; they appear to be unrealistically high. The observed density of 1 moose to 1.4 square miles in this area in the 1960 aerial census is a more realistic density.

5. More research into daily moose defecation rates and the proper aging of pellet groups are required before much reliance can be placed on these as population indices for moose.

6. It is believed that the range on which the study was conducted has reached its maximum carrying capacity. The present degree of browsing evident on the range will likely result in serious overbrowsing in the near future.

Reference

Simkin, D. W. 1959. Big Game Browse and Pellet Survey in Sioux Lookout District. Ontario Dept. Lands & Forests, Fish & Wildlife Management Report, No. 46.

ONTARIO DEPARTMENT OF LANDS AND FORESTS
MOOSE BROWSE TALLY FORM*

NAME OF AREA Wintering River SIZE IN ACRES 640 DATE May 16, 1963
LINE NO. 1 PLOTS 1 TO 9
DISTRICT GERALDTON COUNTY - TOWNSHIP Salsberg
PLOT SPACING 4 chains COMPASS COURSE Due West LOCATION see map
CREW B. Gibson, J. Gow.

PLOT NO.	1	2	3	4	5	6	7	8	9	TOTALS	
SPECIES	K·L H·B	K·L H·B	K·L H·B	K·L H·B	K·L H·B	K·L H·B	K·L H·B	K·L H·B	K·L H·B	EK EH	EL EB
WHITE BIRCH						· 6 · 4			· 2 · 2	0 0	8 6
BALSAM		· 2	· 4 · 2	· 10 2 · 4	· 6 2 · 2	· 2 2 · 0	· 2 0 · 2		1 · 3 2 · 1	1 8	29 11
MOUNTAIN ASH		· 2 · 2		· 1 · 1		2 ·				2 0	3 3
WILLOWS	· 3 · 3	· 4 · 4	· 12 · 10	· 11 · 11	· 18 2 · 11	8 · 15 10 · 12	· 14 2 · 10		· 22 10 · 2	8 24	99 63
MAPLES										0 0	0 0
DOGWOODS			· 2 · 2	· 6 · 2	· 4 · 2			4 · 20 10 · 14	· 8 4 · 4	4 14	40 24
CHERRIES		· 3	· 2	· 4	· 2	· 3		· 4 · 2	· 2 · 2	0 0	20 4
JUNE BERRIES			· 1 · 1	· 2						0 0	3 1
POPLARS	2 · 5 · 3	· 14 · 14	· 8 · 4	· 10 · 3	4 · 14 4 · 9	2 · 12 2 · 4	· 4 · 2	· 10 · 8	· 6 2 · 2	8 8	83 49
HAZEL		· 20 · 19	· 20 · 13	· 4 · 4	· 4					0 0	48 36

Description of Site, Stand, Previous Disburbance Site: flat, sandy, plots 1 to 3; swamp from 4 to 8; number 9 is rolling and drainage is good. Stand: chiefly poplar, jackpine from 1 to 3, black spruce from 4 to 8, poplar and pine on number 9.

F.R.I. Map
Reference No 495871 Disturbance: plots 6 to 9 were logged in 1949-50 for pulpwood species.

Sketch of Area Surveyed

Line No___

Chains

* Seven other tally forms showing the balance of the 64 plots surveyed accompanied the original report now in the Fish and Wildlife Library, Maple.

A SURVEY FOR CONTROLLING PORCUPINE DAMAGE IN WOODLOTS

by
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Abstract

The most severe porcupine damage was found to occur in conifer plantations of 12 years and older. A survey was made of porcupine habits with a view to devising a practical control method. Since most bark feeding is done during the colder months survey results indicated that winter is an ideal time for control work. Feeding habits are described in some detail. Winter patrols of areas in which significant damage is occurring using a gun and poison bait appears to be a satisfactory way of eliminating offending porcupines. Although a detriment to forests, the porcupines influence on other wildlife appears favourable. Indiscriminant destruction, therefore, is not recommended.

Porcupine damage is a problem of increasing importance in the Agreement Forest tracts in Grey County of the Lake Huron District. The Agreement Forests in Grey contain over 20,000 acres made up of small tracts scattered throughout a predominately agricultural county. Most of the forest types in these tracts are natural hardwoods with conifer plantations covering one-third of the area. The plantations are young, the oldest being established 25 years ago.

The major protection requirement for the natural woods has been fencing to protect regeneration from damage by cattle. In the plantations, the main protection measures have been fencing and insect spraying. No fires have as yet occurred and preventive measures are undertaken.

Although the habitat of the porcupine is in natural woods, the most severe damage occurs in conifer plantations of 12 years and older. As the many young plantations reach this age porcupine control will likely become increasingly important.

In order to devise a practical porcupine control method a survey of their habits was made in the winter of 1962-63. This was combined with field tests of several extermination methods.

Survey Details

Several factors indicated that a practical control could be obtained through the extermination of the offending animals. Facts considered important were the porcupine's reproduction rate of usually one or sometimes two young a year, its limited range, slowness afoot and year-round activity. These points along with the fact that the most of the bark feeding is done during the colder months indicated that the snowy periods of winter would be the best for control work.

From previous observations it was noted that most damage occurred near the edge of plantations which bordered natural woods.

A patrol was initiated along eight miles of plantation edge in five areas of likely damage in order to locate trails which are easily spotted in fresh snow. Several areas of natural woods which had suffered damage were also included. Notes were made on tree species, degree of damage and porcupine habitat. In addition, one area of 55 acres (Compartment 25) was surveyed. This area includes a 17 year old red pine plantation and natural mixed lowland woods. This area was surveyed intensely to determine the wintering population of porcupines and the extent of damage to the plantation. Methods used to exterminate porcupines were by shooting and through the use of chloroform and strychnine.

Information Obtained for Survey

Results of the survey confirmed winter as an ideal time to undertake a control program. Porcupine trails and dens are easily located in snow. Main trails take on a trough-like appearance which run between the den and feeding area. In many cases, fresh feeding debris on the snow could be located easier than the trail. Tree stems freshly stripped of bark are also very noticeable in the winter. The porcupines were usually in their dens in the day time. Almost all feeding was done at night.

Patrolling just inside the edge of conifer plantations adjoining natural woods proved to be an effective means of locating winter activity. In most cases the dens are in the natural woods so that the trail can be located if they are feeding in the plantation. Where dens were located in the plantation, they were within 100 feet of the edge.

At Compartment 25 the survey of damage in 18 acres of red pine showed that 70 per cent of the damage was within 50 feet and 98 per cent was within 150 feet of the edge of the natural woods.

The damage occurs progressively deeper into the plantation as the trees near the edge are destroyed. Feeding Habits: The feeding on trees noted during the survey varied considerably. The two main types of feeding are bark and browse. Bark feeding consists of the gnawing of bark from the main stem and branches. This is usually in the form of a complete girdle and is most frequently located in the upper third of the tree, although bark damage was commonly noted at all heights. On some species of trees such as larch, the bark may be removed from almost the entire length of the stem. In others the extend of feeding was usually only one to three feet. Large beech were often damaged around the base of the tree.

Plantations of red and white pine under 15 feet in height are seldom attacked. Larch and scots pine, however, are often heavily damaged at smaller sizes.

A tally of the damage in the 18 acres of red pine at Compartment 25 showed that 636 trees had been girdled and estimated 100 trees were partly girdled. The total number of trees in the stand was not tallied. Based on the original planting and allowing for normal mortality and the cutting of a road the estimated number of trees would be about 17,000. The damage overall would then be approximately 4 per cent. Since the damage is usually concentrated, a particular area may have a considerably higher per cent of damage. The damage is estimated to have occurred over the past four years. A crop tree pruning done in the winter of 1960-61 indicated that the removal of branches 8 to 10 feet in height did not influence the choice of trees fed upon. Pruned trees were damaged in about the same proportion as unpruned trees.

The tree species most frequently damaged by bark feeding are larch, scotch pine and red pine in plantations and hard maple in natural woods. Other species commonly fed on are white pine, beech, hemlock and soft maple. Damage was also noted on basswood, elm, spruce and balsam fir. In areas of low population, damage on hard maple is usually confined to a small number of trees frequently around cankered areas. White pine bark was often eaten around blister rust cankers. This type of feeding is also occasionally done by squirrels.

Browse feeding appeared to be the principal winter food of most porcupines. This feeding was most prevalent on cedar and hemlock with browse of white pine and red pine also commonly eaten. Browse feeding appears to occur to some degree on all species where bark is taken. Heavy feeding of this type was confined to a relatively few trees and damage to timber trees, with a few exceptions, was insignificant.

Habitat: Although porcupines range throughout all types of wooded areas the highest populations by far occur in mixed lowland stands and in and about limestone escarpment areas. Both these areas contain numerous den chances. Normal winter movement appeared to be limited to less than 500 feet from the den. In lowland areas dens were usually located under large rotting stumps or tree roots while dens in the escarpments were made in cave-like crevices in the limestone. Many dens consisted of snow, supported by roots or fallen trees which were exposed in the spring. The inner chambers had diameters as large as ten feet. It was noted, however, that some animals do not use dens, but merely remain in the dense foliage of trees such as hemlock and pine for long periods. One porcupine was found to have been using, for some time, an exposed resting place at the base of an elm tree. The population in 55 acres surveyed in February was ten porcupine or one per 5.5 acres. Nine of these ten were located in dens in the lowland stands and one in the plantation. Six of these animals were within an eight acre area. A count along 20 chains of escarpment revealed six dens. A den may contain one or two animals.

Extermination Methods: While patrolling the plantations a rifle was carried to destroy any animals encountered. In the heart of winter, however, most porcupines were in their dens in the daytime, so that other methods of eliminating them were needed. One method tried with little success was to drop a chloroform soaked rag into the den and then plug the hole with snow. This method stopped activity at the first den encountered, but was not successful at any others. In a number of cases activity stopped for several days, but then resumed again. The lack of success was probably because of the large chamber and long entrance tunnel of most dens.

Another method used was to drop a piece of apple into the den into which were inserted a few granules of strychnine sulphate. This was very successful in stopping activity and further tests are planned.

Incidental Notes of Interest

Wildlife:

While making this survey an interesting relationship between porcupines and the snowshoe hare was observed. In the process of feeding on browse, which occurred most frequently on cedar, considerable amount of green foliage dropped to the snow. This provided a food supply for the snowshoe hare which virtually trampled flat the areas under these trees. Since a

porcupine usually over-winters in one small area and feeds almost daily, a continuous, easily located, food supply is made available to the snowshoe. The hares not only benefit from food, but also make liberal use of the porcupine's den during the winter. This was further confirmed by examining a number of dens after the snow melted and discovering a considerable amount of droppings from both hares and porcupines. Since this relationship occurs during the most severe part of the year, the effect on the local wintering snowshoe population would appear to be highly beneficial. Companionship is the only apparent advantage the porcupine receives.

Porcupines are of value of wildlife in other ways since they tend to reduce the proportion of larger trees which encourages ground growth on which a number of animals feed.

Forestry:

It had been noted that bark feeding on maple often occurs around damaged or diseased areas of a tree. These areas apparently contain a higher concentration of carbohydrates. This selective feeding was clearly brought out in an area of pole-size hard maple which had been thinned by frill girdling followed by an application of 2,4,5-T and oil mixture in the fall of 1962. In October, 1963, it was observed that over 60 per cent of the treated trees had been girdled by porcupines feeding just above the original girdle. Although there is a high population of porcupines nearby, there has been no previously noticeable feeding nor were untreated trees damaged in the area surveyed. The likely reason for this sudden increase in feeding is that the treated maple remain active the first year but are unable to transport carbohydrates down past the girdle, causing a concentration in the area above. The porcupines have been surprisingly quick to take advantage of this situation.

Discussion and Conclusions

Results from this survey indicate several approaches to the problem of porcupine damage in Grey County.

Winter patrols of areas in which significant damage is occurring using a gun and poison bait appears to be a satisfactory way of eliminating offending porcupines.

In future conifer plantations it appears that considerable damage can be avoided by planting conifer species which are not subject to serious porcupine damage next to areas of high population. More information is required before definite recommendations can be made on this point.

With a properly organized approach the elimination of damage by porcupines should not become an involved, costly operation even though there are numerous small plantations to protect.

Although a detriment to forests, the porcupine's influence on other wildlife appears favourable. Indiscriminant destruction, therefore, can not be recommended. Studies directed at understanding the total influence of porcupines under the circumstances present in this area are highly desirable.

Although much maligned, the porcupine does have a homely charm about him once you get to know him.

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PHEASANT HARVEST REPORT, LAKE SIMCOE DISTRICT, 1963

by
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Abstract

A total of 6,598 township hunting licences consisting of 2,787 resident and 3,811 non-resident were sold in the fifteen regulated townships, up to and including November 2, 1963, the close of the pheasant season. This is an increase of 4.1 per cent over the previous year. Fifteen thousand, three hundred pheasants made up of 10,300 day-olds, 4,700 poults and 250 adults were distributed to the township for raising and releasing. A field check of 2,097 hunters during the open season showed 572 pheasants harvested, for a hunter success of .45 birds per hunter. Time required to kill a pheasant was 7.5 man-hours. These success figures compare favourably with the previous season. Unusually warm weather prevailed during the season and no doubt this had an adverse effect on hunters, dogs, and birds.

Open seasons

October 16 - November 2 - Counties of Dufferin, Peel and York. Townships of Adjala, Essa, Tosorontio, Innisfil, Tecumseth and West Gwillimbury in Simcoe County and the Townships of Pickering, Reach, Scott, Uxbridge, Whitby and E. Whitby in the County of Ontario.

October 5 - November 2 - Remainder of the District

Statistics

Although the hunting of pheasants was open throughout the entire District, our figures cover only ten regulated townships in the District. The remaining regulated Townships, Adjala, Tecumseth, West Gwillimbury, Toronto Gore and East Gwillimbury, produced little pheasant hunting and the remaining townships of upper Ontario County are well outside pheasant habitat.

	Opening Day	Entire Season
No. of parties checked in field	289	858
No. of parties using dogs	178	457
No. of hunters checked in field	796	2,097
No. of man-hours hunted	2,675	7,049
No. of cocks bagged	282	572
No. of hens bagged	167	370
Total pheasants bagged	449	942
Per hunter-cock	.35	.27
Per hunter-hen	.21	.18
Per hunter total	.56	.45
Man-hours to bag a bird	6.0	7.5
Pheasants seen but not shot	904	1,652
Sex ratio c/h shot	1.7-1	1.5-1
Sex ratio c/h seen	1.2-1	1.2-1

Distribution

A total of 15,300 pheasants made up of 1,300 day-olds, 4,700 poults and 250 adults were received in the District for distribution. See Table 2 for distribution to townships. Day-olds were raised to poult size by the townships, Game Commissions and interested sportsmen before release. A loss of some 16 per cent in day-olds on date of arrival and during the first week was attributed to poor condition of chicks from the Dene Hatchery, lack of preparation by one township at time of distribution and improper brooder temperatures at one other spot.

Costs of Raising Chicks by Townships

On request, two Townships, King and Whitchurch in York County kept account of costs to them of raising day-old to poults (8 - 10 weeks).
They amount to,

King Township	605 birds released	cost	$616.50
Whitchurch "	342 " "	cost	$310.00
Total	947 " "	cost	$926.50

Licences

A total of 6,598 licences were sold up to the close of the pheasant season November 2. They consisted of 2,787 resident licences, an increase of 2.4 per cent over 1962 and 3,811 non-residents, an increase of 5.3 per cent making a total increase in township licences sold over the previous year of 4 per cent. See Table 3 for complete coverage by townships.

Weather

Unseasonably warm dry weather prevailed during the open season which had an adverse affect on not only the hunter and his dog, but seemingly on the pheasant as they were difficult at times to flush.

Harvest

Hunter success, bird in the bag and hours to kill a bird are very simmilar to last year, being .45 success and 7.5 hours to kill a pheasant. Hunting took place in all fifteen regulated townships and a few outside spots such as Camp Borden, Stayner and Barrie areas where pheasants were reported shot. See Table I for completed figures.

Comparison with 1962 figures

	1962	1963		
Number of townships reporting	9	10	up	10%
Number of hunters reporting	1,455	2,097	up	44%
Number of parties using dogs	263	457	up	73%
Number of hens reported seen (not shot)	775	623	down	24%
Number of cocks reported seen (not shot)	904	780	down	16%
Number pheasants reported harvested	672	942	up	29%
Hunter success	.46	.45		
Man-hours to bag a pheasant	7.4	7.5		

Remarks

Overall figures in comparison with the previous year show approximately the same hunter success figures - C/H ratio harvest shows only a very slight decrease from 1962 and stands at 1.5 cocks for each hen. In the C/H ratio of birds seen but not shot no change is reported and it remains at 1.2 cocks for each hen.

Success figures in the Townships of Pickering, Whitchurch, Albion, Caledon and Chinguacousy held their own or slightly increased from the opening day to the close of the season. The opening day of the pheasant season in the Township of Toronto, the 87 hunters checked showed a success figure 1.04 birds per hunter and as little as only 2.2 hours to bag a pheasant. Banded pheasant recovery during the season from pheasants banded in previous years in other than Whitchurch Township was practically nil. (A banding report will be tendered in the near future.).

Taking into consideration the unusually warm weather which prevailed during the open season it is a surprise to us that our hunter success stood up as well as it did. Although last year's hunter success figure was down 12 per cent from that of 1961 it was felt that this figure would again take a drop this year. Townships in Peel County produced much better hunting than last year and success figures in Toronto on the opening day were excellent. This township with little more than 1/3 of its area open has in recent years produced some good habitat through much of the land left uncultivated. It would appear from the abundance of hens seen and not shot in comparison with cocks, that there would be a fair density of hen birds throughout the District after the shoot. Whitchurch Township which again made a substantial effort to produce better hunting by planting close to 1,000 pheasants in some 60-odd spots throughout the township showed a slight decrease in the success figures from the previous year. Good pheasant habitat here is found mostly in the lower four concessions with the posting of land against trespass similar to 1962.

It has now been apparent for a few years that artificially raised pheasants released in this District do not survive in any number to reproduce the following year. With this thought in mind we would recommend (1) that fewer pheasants than are now received be raised to adult stage and released into the field prior and during the open season, and (2) that the bag limit per day be three birds of either sex.

Table 1

PHEASANT HUNTING STATISTICS, 1963
LAKE SIMCOE DISTRICT
OPENING DAY AND ENTIRE SEASON

	Whitby		E. Whitby		Pickering		Markham		Whitchurch		King	
	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season
No. of Parties	25	77	6	15	33	107	77	180	70	195	3	20
Parties Using Dogs	21	56	4	8	16	42	58	121	36	86	2	14
No. of Hunters	66	210	16	45	98	296	238	489	162	433	7	50
Total Hunter-hours	225	629	90	221	388	1,246	911	1,742	475	1,459	24	144
Cocks Bagged	32	69	8	12	25	64	85	134	31	89	4	14
Hens Bagged	23	44	5	6	23	80	59	100	9	23	4	10
Total Bag	55	113	13	18	48	144	144	234	40	112	8	24
Per Hunter-Cock	.48	.33	.50	.27	.26	.22	.36	.27	.19	.21	.57	.28
Per Hunter-Hen	.35	.21	.31	.13	.23	.27	.25	.21	.06	.05	.57	.20
Per Hunter Total	.83	.54	.81	.40	.49	.49	.61	.48	.25	.26	1.14	.48
Hr. to bag a bird	4.1	5.6	6.9	12.3	8.1	8.7	6.3	7.4	11.9	13.0	3.0	6.0
Cocks seen(not shot)	98	150	12	19	61	114	168	237				10
Hens seen(not shot)	71	105	12	22	55	90	152	230				9
Total seen(not shot)	169	255	24	41	116	204	320	467	98	249	9	19
Sex ratio c/h shot	1.4-1	1.6-1	1.6-1	2.0-1	1.1-1	1-1.2	1.4-1	1.3-1	3.4-1	3.9-1	1-1	1.4-1
Sex ratio c/h seen	1.4-1	1.4-1	1-1	1-1.2	1.1-1	1.3-1	1.1-1	1.1-1				

Table I (continued)

PHEASANT HUNTING STATISTICS, 1963
LAKE SIMCOE DISTRICT
OPENING DAY AND ENTIRE SEASON

	Albion		Caledon		Toronto		Chinguacousy		District Total	
	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season	Open Day	Entire Season
No.of Parties	9	9	26	57	37	172	3	26	289	858
Parties Using Dog	2	2	15	29	22	84	2	15	178	457
No. of Hunters	30	30	89	151	87	341	3	52	796	2,097
Total Hunter-hrs.	109	109	245	491	202	817	6	191	2,675	7,049
Cocks Bagged	6	6	22	33	68	137	1	14	282	572
Hens Bagged	5	5	16	30	23	55		17	167	370
Total Bag	11	11	38	63	91	192	1	31	449	942
Per Hunter-Cock	.20	.20	.25	.22	.78	.40	.33	.27	.35	.27
Per Hunter-Hen	.17	.17	.18	.20	.26	.16		.33	.21	.18
Per Hunter Total	.37	.37	.43	.42	1.04	.56	.33	.60	.56	.45
Hr. to bag a bird	9.9	9.9	6.4	7.8	2.2	4.3	6.0	6.2	6.0	7.5
Cocks Seen(not shot)	2	5	25	39	71	181	1	25	438	780
Hens Seen(not shot)	12	2	32	55	24	83	1	27	359	623
Total Seen(not shot)	14	7	57	94	95	264	2	52	904	1,652
Sex ratio c/h shot	1.2-1	1.2-1	1.4-1	1.4-1	2.9-1	2.5-1		1-1.2	1.7-1	1.5-1
Sex ratio c/h seen	1-1.7	2.5-1	1-1.3	1-1.4	3-1	2.2-1	1-1	1-1.1	1.2-1	1.2-1

Table 2

PHEASANT DISTRIBUTION
1963
LAKE SIMCOE DISTRICT

TOWNSHIP	DAY-OLDS	POULTS	ADULTS	TOTAL
Whitby	1200	350		1550
E. Whitby	1500	400		1900
Pickering	1500	600	25	2125
Markham	500	600	25	1125
Whitchurch	1000	600	50	1650
King	700	600	40	1340
E. Gwillimbury	500	300		800
Peel County	2500	900	60	3460
Adjala	200	100	15	315
Tecumseth	500	100	20	620
W. Gwillimbury		100	15	115
Sub Total	10,100	4,650	250	15,000
Misc. (Stayner Club)	200	100		300
	10,300	4,700	250	15,300

Table 3

LAKE SIMCOE DISTRICT
TOWNSHIP LICENCES ISSUED NOVEMBER 2, 1963

TOWNSHIP	RESIDENT	NON-RESIDENT	TOTAL
Whitby	250	300	550
E. Whitby	86	290	376
Pickering	410	400	810
Markham	343	300	643
Whitchurch	194	600	794
King	363	200	563
E. Gwillimbury	132	272	404
Albion	78	100	178
Caledon	90	200	290
Chinguacousy	150	200	350
Toronto	522	149	671
Toronto Gore	10	100	110
Adjala	10	200	210
Tecumseth	80	300	380
W. Gwillimbury	69	200	269
Total	2,787	3,811	6,598

SECOND INTERIM REPORT CONCERNING FISHERIES IN THE NORTH ARM OF RAINY LAKE

by
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Abstract

During April and May, 1963, a total of 1078 walleyes were tagged in the North Arm of Rainy Lake. Three hundred and forty-seven of these were tagged in North West Bay, the remainder (731) at Wasaw Creek, Stanjikoming Bay. By October 1, 1963, recoveries totalling 71 (20.7%) from North West Bay and 148 (20.2%) from Wasaw Creek were recorded. Trap netting was carried out on the North Arm from May 24 through June 15 with the assistance of the Net Section from Port Arthur. One hundred and twenty-two lifts took 313 walleyes. Age and growth studies, using the data from these and commercial catches, document the rise of a new strong year class. Recommendations for future studies are made.

Introduction

An intensive study of the North Arm of Rainy Lake was initiated in 1962 with the object of finding out what pressure was being exerted on the walleye fishery in this portion of the lake. This study was continued in 1963 with additional tagging. Trap netting superceded the use of gill nets for sampling walleyes during the early summer period.

Method

Capturing and tagging methods were the same in 1963 as they were in 1962 (see First Interim Report - 1962).

Mid-summer netting was carried out using two six-foot and two eight-foot trap nets. A total of 122 lifts were made. All fish were recorded, and three hundred and thirteen walleyes were measured and scale samples taken.

Scale samples were collected from the commercial fishery during August. These scales were taken at the local fish packing plant as the fishermen brought the fish in from the lake.

Results

Each area will be dealt with separately due to their location on the North Arm.

North West Bay

An 8-foot trap net was set on April 16 and removed from the water on May 3. During this time 14 lifts were made. Total catch is shown in Table I.

TABLE I

TOTAL CATCH AND CATCH PER LIFT OF EIGHT-FOOT TRAP NET NORTH WEST BAY

Date	Wal-leye	N. Pike	Perch	Lawyer (Burbot)	Cisco	Common Sucker	Crap-pie	Sauger	R. Bass	RH Sucker
April 17	35	18	10	4	12	48				
18	31	2	6	8	10	26	2			
19	31	2	18	15	20	27				
20	32		18	12	36	35				
22	20	4	9	9	34	2				
23	32	1	11	4	8	2				
24	43	2	11	5	5	91	2			
25	13	1	30	2		31				
26	50	6	19	2	10	193		1		
27	43		49	3	1	404	2	1		
28	28		48	11	3	607	3	1		
29	11	2	17	9		122			1	
May 1	24	5	16	2	5	485	4		1	1
3	10	1	14	2	4	1382	4		2	1
Total 14 Lifts	403	44	276	88	148	3455	17	3	4	2
Fish per Lift	28.8	3.1	19.7	6.3	10.6	246.8	1.2	.2	.3	.1

Forty-five walleyes tagged in 1963 were recaptured in subsequent lifts and two walleyes tagged in 1962 were returned without harm. One walleye showing definite marks of being tagged the year before was retagged. Two other walleyes having marks resembling scars from lost tags were also retagged.

All walleyes were measured for total length; one hundred scale samples were taken and all fish were sexed.

Mean total length of all fish tagged was 16.5 inches in 1963. This length is slightly larger than the 1962 tagged fish, which measured 15.9 inches (mean total length). Males in 1963 averaged 15.8 inches (T.L.) and females averaged 19.3 inches (T.L.). The ratio of male to female was 6.1:1 (298 males to 49 females).

A total of 72 (20.7%) tags were returned to the District Office by October 1. Commercial fishermen reported 88.9 per cent of the total recaptures while the other 11.1 per cent were reported by anglers.

Wasaw Creek

An eight-foot trap was set at Wasaw Creek on April 24 and removed from the water on May 26. During this time 12 lifts were made. Total catch is shown in Table II.

TABLE II

TOTAL CATCH AND CATCH PER LIFT OF SIX-FOOT TRAP NET WASAW CREEK

Date		Walleye	N. Pike	Perch	Crappie	C.Sucker	RH Sucker	R.Bass	Cisco
April	25	186	44	15	100	40	1	1	
	26	92	23	58	21	92	2		
	27	146	38	24	11	149	2		
	28	95	25	28	12	202	1		
	29	84	15	26	51	114			
	30	59	13	43	13	225			
May	1	28	46	6	59	163			
	2	35	12	13	31	654		1	
	3	22	33	14	31	711	1	3	
	4	18	30	6	22	210	1	1	
	5	10	131	1	183	27			1
	6	7	106	4	321	19		1	
Totals		782	516	238	855	2506	8	7	1
Fish Per Lift		65.2	43.0	19.8	71.2	217.2	.7	.6	.1

Of the 782 walleyes taken 731 were tagged. There were approximately 50 walleyes lost from this net due to some very heavy lifts e.g., walleyes were being gilled in the tunnel. This tunnel was eventually replaced by one with smaller mesh.

All walleyes were measured and sexed, but no scale samples were taken. It was felt that due to the small boat used in this operation and the large amount of fish the net was catching, many more fish would have been lost had we taken time to obtain scale samples.

The mean total length of all walleyes tagged at Wasaw was 16.3 inches. The male fish averaged 15.9 inches while the females averaged 19.4 inches. The ratio of male to female fish was 5.8:1 (623 males to 108 females). In both the North West Bay and Wasaw Creek spawning runs the male to female ratio was less than one-half that found during the joint survey conducted by Minnesota and Ontario in 1959. In the Rat Root - Black Bay run in 1959 the ratio of male to female was 14.7:1.

A total of 148 (20.2%) tags were returned by October 1. Of these the anglers returned 73.6 per cent, the commercial fishermen 26.3 per cent.

Age and Growth

From the 100 scale samples taken at North West Bay 98 were used for aging. The results are shown in Table III.

TABLE III

RESULTS OF AGING 98 WALLEYES FROM NORTH WEST BAY SPAWNING RUN

Per cent of Total	No.	Annuli	Mean Total Length	Range
1.0	1	III	14.1	
68.4	67	IV	16.1	13.9 - 17.8
13.3	13	V	16.2	14.9 - 17.7
4.1	4	VI	19.1	18.0 - 21.0
8.1	8	VII	20.6	19.2 - 22.0
4.1	4	VIII	21.2	19.8 - 22.2
1.0	1	IX	23.8	-----
100	98			

Aging showed four annuli fish or fish of the 1959 year class largely dominating the North West Bay spawning run by comprising nearly 70 per cent of the entire sample. Although four-year-old fish are often the most numerous age group in spawning runs due to the fact that most fish mature by this time, the large percentage of fours is rather unusual and would appear to indicate a strong 1959 year class.

Trap Netting

With the assistance of the Net Section from Port Arthur, trap netting was started on May 24 and continued until June 15. During this time two 6-foot and two 8-foot traps were used. A total of 122 lifts were made.

All fish were recorded, 313 walleyes were measured and scale samples taken. Tables IV through VII in Appendix show number of lifts and catch from each net. It is noticed that the catch per lift for walleye for the 8-foot nets is better than that of the 6-foot nets. It was the opinion of one of the men from the Net Section that 10-and 12-foot nets would catch better yet. The catch per lift for the other species is roughly the same although the 8-foot net does catch slightly better than the 6-foot net.

TABLE VIII

RESULTS OF AGING 291 WALLEYES TAKEN FROM TRAP NETS

Per cent of Total	No.	Annuli	Mean T. Length	Range
10.0	29	II	10.7	9.8 - 12.0
17.9	52	III	13.6	11.6 - 14.9
59.0	172	IV	15.2	13.1 - 17.5
5.2	15	V	16.4	14.9 - 18.7
5.2	15	VI	18.7	16.1 - 21.4
2.7	8	VII	19.6	16.5 - 22.4

The mean total length of the 313 fish measured was 15.4 inches. The aging shows a predominance of four-year-old fish (1959 year class) which also appeared strong in the earlier netting. The aging also shows the possibility of 1960 and 1961 as being good spawning years.

Commercial Fish Data

During the month of August scales were collected from the commercial catch on Rainy Lake. From the North Arm 167 scales were aged. The mean total length of these fish was 17.4 inches. Table IX shows the aging results.

TABLE IX

AGING RESULTS OF SAMPLE OF COMMERCIAL CATCH (NORTH ARM)

Per cent of Total	No.	Annuli	Mean T. Length	Range
7.2	12	III	16.1	14.3 - 17.1
85.0	142	IV	17.5	15.6 - 19.4
7.2	12	V	18.3	16.3 - 19.2
0.6	1	VI	17.5	-----

Here again the 1959 year class has shown up very strongly with 85 per cent of the fish aged in age group four. The fast growth of this year class is probably due to a low population density which apparently existed following the demise of the 1954 and 1955 year classes which supported the fishery a number of years prior to 1961.

Conclusion

Tag returns from two spawning runs in Rainy Lake's North Arm show that out of 1078 walleyes tagged in 1963, 219 or 20.3 per cent were returned during the first five months.

Aging of these fish and those taken by trap netting and commercial fishing show four-year-old walleyes dominating the catch and that the fishery is very dependent upon these fish. It is becoming increasingly evident that the observed fluctuations in both the sport and commercial fishery are due to the appearance of strong or weak year classes.

Movements of tagged fish as indicated by the returns show much the same pattern as found previously i.e. movement is rather localized and for the most part does not extend to other portions of Rainy Lake. It is logical to assume then that the effect of a successful year class is also localized and not necessarily indicative of successful year classes in more distant portions of the lake.

As to the area under study, the 1959 year class appears to be a strong one and it is possible, but not definitely proven, that 1960 and 1961 may also be good. Some of the commercial fishermen on the North Arm are reporting good catches of small walleyes bearing out our May - June trap netting catches, however, additional data should be collected to prove this belief.

Recommendations

These data indicate, as does other information collected on Rainy and other lakes, that strong year classes often dominate the catch and provide the bulk of the fishing often for a period of years. As we do not know the cause of strong and weak year classes on Rainy Lake, it is recommended that our investigations be extended in an attempt to determine where spawning areas exist, what success is had and what contribution is made. This could be done by shoreline egg sampling immediately following spawning in the spring.

Continued work on commercial catches appears necessary in conjunction with age and growth studies and should be continued.

Creel census carried out by our officers since 1956 got off to a poor start this year and as a result insufficient data were collected to complete this year's analysis of sport fishing success. As this information is necessary in documenting the occurrence of population fluctuations in conjunction with other studies and those of Minnesota, it is recommended that concentrated efforts be made to obtain this information in 1964.

Acknowledgments

Many thanks go to the officers, summer students and the personnel from the Net Section for their help in obtaining the data for this report. Special thanks goes to Tom Bonde of the Minnesota Department of Conservation. Through his suggestions and editing, this report was greatly improved.

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APPENDIX

TABLE IV

SUMMARY OF CATCH AND CATCH PER LIFT OF TRAP #1 - (6 FOOT)

*Lifts	W.	N.P.	W.S.	P.	SMB	RB	Crappie	Burbot	Sauger	Cisco
3	2	38	4	8	1	4	2			
4	10	62		26	12	9	2	1		
3	2	57	14	28	3	6	2			
2	1	33	5	14	7	19	1			
1	3	55			5					3
3	3	15	17	12	12	36				
1		16	5		1		1			
2	4	11	4	4						
1	1	18	1	1	14		2			
3	5	55		19	3	7	7			
1	2	12		4	10	34				
24	33	372	50	116	68	115	17	1		3
Catch per Lift	1.4	15.5	2.1	4.8	2.8	4.8	.7	.04		.1

*Number of lifts made at each location i.e. (I) net moved after 3 lifts.

TABLE V

SUMMARY OF CATCH AND CATCH PER LIFT OF TRAP NET #2 (6 FOOT)

Lifts	W.	NP	WS	P.	SMB	RB	Crappie	Burbot	Cisco	RH	Sauger
6	14	81	22	38		7	2				
4	3	47	17	8	1	19		2			
6	7	84		13	12	13	5		3		
2		42		8	5		1				
2	1	12	9	12	10	28					1
2		40			1		4				
5	30	111	18	40	15	1	33		1	1	
3	7	36	6	66	2	42	5				
2		35		3	1	5	1				2
2	6	38		30	5		3				
3		21	1	13	7	27					
37	68	547	73	231	59	142	54	2	4	1	3
Catch per Lift	1.8	14.8	2.0	6.2	1.6	3.8	1.5	0.5	.1	.03	.08

W - Walleye

N.P. - Northern Pike

W.S. - Common Sucker

P. - Perch

SMB - Smallmouth Bass

RB - Rock Bass

Cr - Crappie

Bu - Burbot

Sa - Sauger

C - Cisco

RH - Redhorse Sucker

TABLE VI

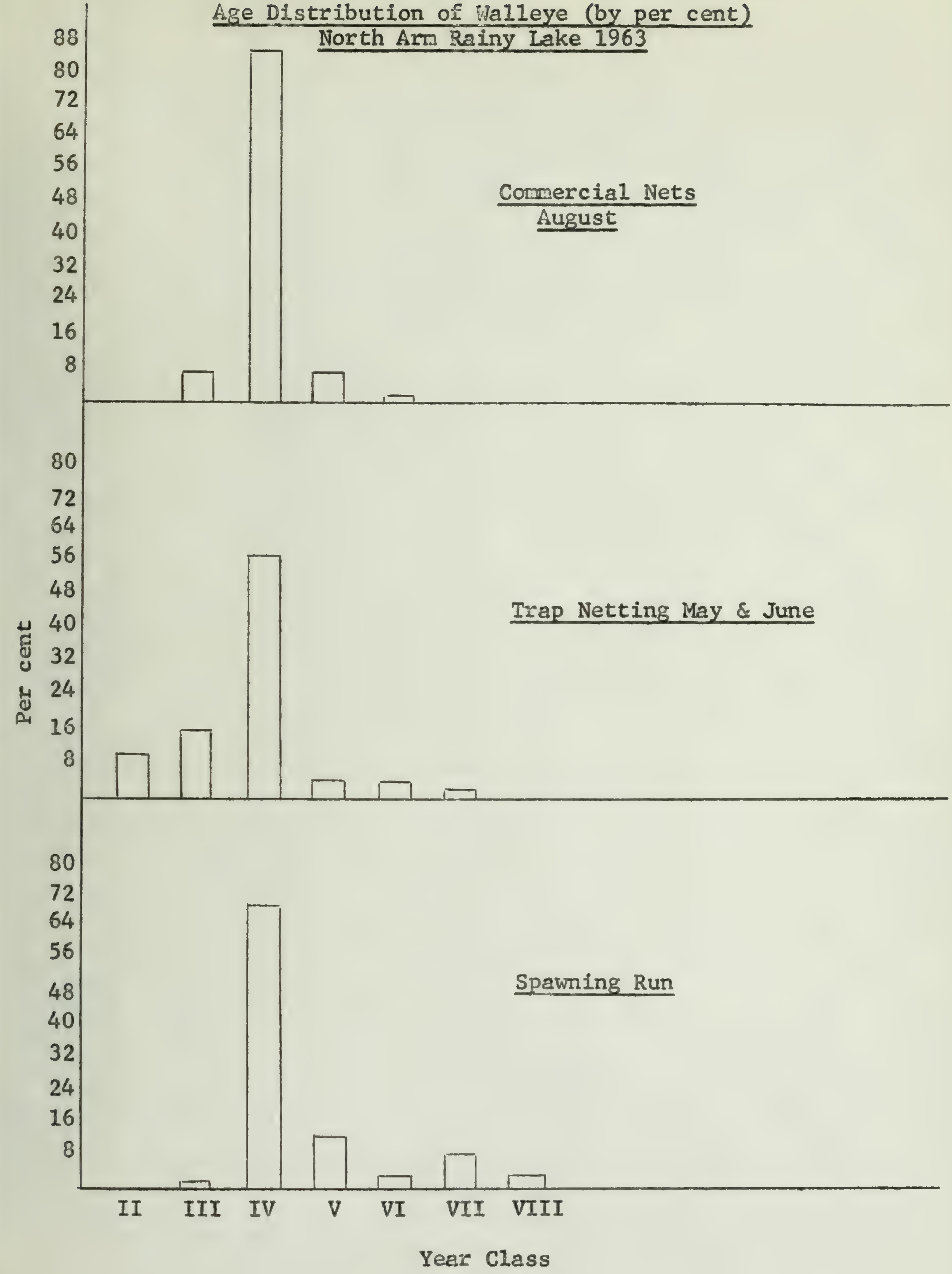
SUMMARY OF CATCH AND CATCH PER LIFT OF TRAP NET #3 - (8 FOOT)

Lifts	W.	N.P.	W.S.	Perch	SMB	R.B.	Crappie	Bu.	Sa.	Cisco	RH
5	12	87	32	7	1	39	2	3	7		
4	19	35	54	10	9	17	6	4	2		
4	1	15	5	3	12	64	2		1		
5	24	168	37	47	33	42	16		1		
5	8	23		19	4	23	1		4	46	
5	42	146	12	6	16	49	12				3
6	57	285	43	166	9	31	14				
34	163	759	183	258	84	265	52	7	15	46	3
Catch per Lift	4.8	22.3	5.4	7.6	2.5	7.8	1.5	.2	.4	1.4	.09

TABLE VII

SUMMARY OF CATCH AND CATCH PER LIFT OF TRAP NET #4 - (8 FOOT)

Lifts	W.	N.P.	W.S.	Perch	SMB	R.B.	Crappie	Bu.	Sa.	Cisco	RH
4	1	43	46	2		3	3			4	
4	5	18	30	47		2		7	2	5	
2	1		30	30		1		6		6	
5	40	38	75	31	3	55	4		1	2	2
4	25	50	54	43	12	29	1	1	2		
3	60	28	17	3	17	14	15			5	2
5	18	173	10	10	25	86	3	1	2		5
27	150	350	262	166	57	190	26	15	7	22	9
Catch per Lift	5.6	12.9	9.4	6.1	2.1	7.0	.9	.6	.3	.8	.3



Age Distribution of Walleye (by per cent)
North Arm Rainy Lake 1963